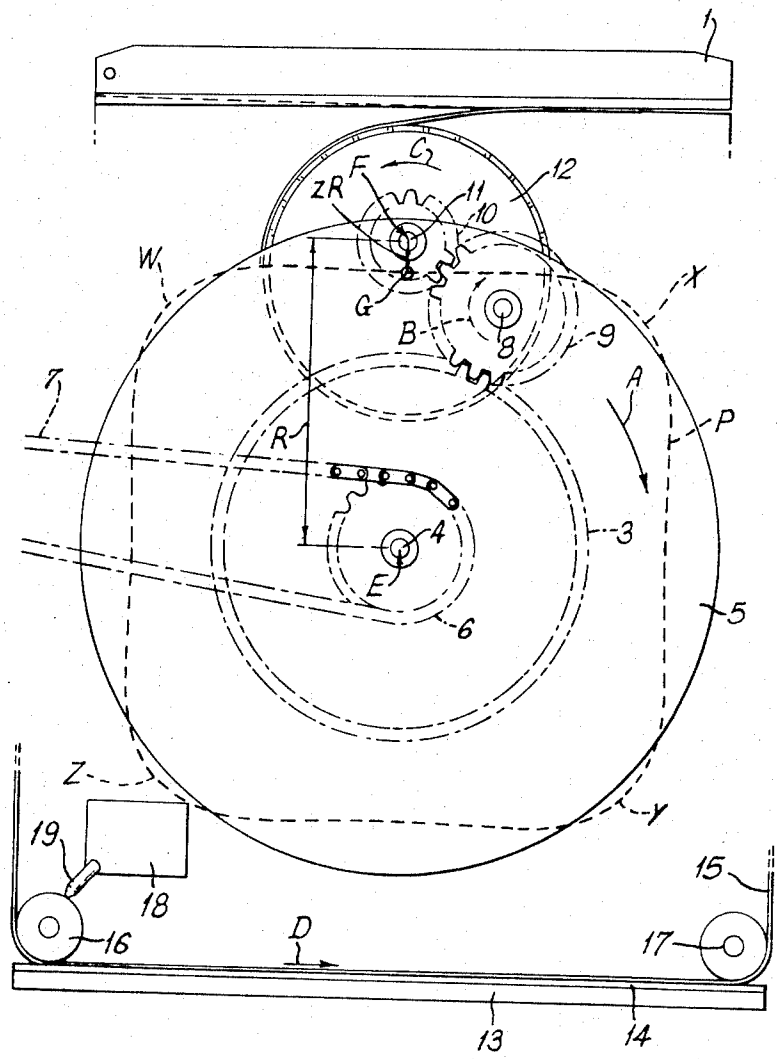
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APPARATUS FOR APPLYING TEAR STRIPS TO WRAPPERS

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APPARATUS FOR APPLYING TEAR STRIPS TO WRAPPERS

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ABSTRACT OF THE DISCLOSURE

Apparatus for applying a tear strip or the like to a wrapper web comprises a sun gear about which a planet carrier is rotated. A first planet gear meshes with the sun gear and also with a second planet gear, both being mounted on the planet carrier. A suction wheel is eccentrically mounted on the second planet gear, which results in the suction wheel rotating about the axis of the second planet gear and at the same time traversing a substantially rectilinear polygonal path as the planet carrier is rotated.

A device for cutting tear strips or the like from a web is positioned adjacent to one side of the polygonal path and as the suction wheel moves along this side the tear strip is wound on to the suction wheel.

The wrapper web is guided over a platform, having a resilient covering, and has a line of adhesive applied to it. The platform is positioned adjacent to a different side of the polygonal path and while the suction wheel is traversing this side the tear strip contacts the adhesive and is unwound from the suction wheel and deposited on to the wrapper web.

The present invention relates to apparatus for applying strips of material to wrappers and is particularly applicable to applying a tear strip to a cellophane wrapper web which is subsequently used for wrapping packets of cigarettes.

According to the present invention apparatus for applying a tear strip or the like to a wrapper web comprises a sun gear, a planet carrier, means for continuously rotating said planet carrier about said sun gear, a first planet gear, rotatably mounted on said planet carrier, and meshing both with said sun gear and with a second planet gear also rotatably mounted on said planet carrier, a suction wheel mounted eccentrically on said second planet gear, so that said suction wheel is moved in a substantially rectilinear polygonal path having n sides, said suction wheel being adapted to take up a cut tear strip or the like while said planet carrier is moving through a first arc of its circular path and adapted to deposit said tear strip or the like on a wrapper web while said planet carrier is moving through a second arc of its circular path, where in the first arc of movement of said planet carrier corresponds to the suction wheel moving along one of the sides of said polygonal path and the second arc of movement of the planet carrier corresponds to the suction wheel moving along a different side of said polygonal path, the ratio of the diameters of said sun gear and said second planet gear being n:1.

With such an arrangement, a appropriate selection of the relative diameters of the gears will enable the suction wheel to traverse a closed polygonal path which may have three, four or more sides depending upon the diameters of the various gears and their positions relatively to one another.

In a preferred form of apparatus according to the invention said ratio is 4:1 so that the suction wheel moves in a substantially square path. In this case it is convenient to arrange the apparatus so that it is positioned between

a device for cutting tear strips or the like from a web of material and a platform over which the wrapper web is guided, the said cutting device being positioned adjacent one side of said substantially square path and said platform positioned adjacent the opposite side of said substantially square path. With this arrangement, as the tear strip or the like is cut from the wrapper web said planet carrier moves through said first arc of its circular path, and the tear strip or the like is wound on to said suction wheel, which at this stage is moving along that side of the substantially square path which is adjacent the cutting device.

The suction wheel then traverses the other three sides of said substantially square path as the planet carrier moves round its circular path. As the suction wheel is moving along the side of the substantially square path adjacent said platform, which corresponds to said planet carrier moving through the aforesaid second arc of its circular path, the tear strip or the like is unwound from said suction wheel and transferred to said wrapper web.

To allow for the deviation from a straight line of the path of said suction wheel while said tear strip or the like is being unwound therefrom, said platform is provided with a covering of resilient material, over which said wrapper web is guided and said suction wheel rolls.

To facilitate the transfer of said tear strip or the like from said suction wheel, a pulley is positioned adjacent each end of said platform around which said wrapper web passes, one of said pulleys having a gumming device associated with it for depositing adhesive on to its periphery so that as said wrapper web passes around the said pulley a line of adhesive is applied to it, said line of adhesive being so positioned on said wrapper web that said tear strip or the like is unwound from said suction wheel on to said line of adhesive.

How the invention may be carried out will now be described, by way of example only, with reference to the single figure of the accompanying drawing which is a diagrammatic elevation of one embodiment of the invention.

A web of tear strip material (not shown) is fed and cut transversely by a knife **1**, in the manner disclosed in our U.S. Pat. No. 3,502,536, to form tear strips which have a length equal to the width of the web of tear strip material. Such a tear strip, which has been partly cut from the web of tear strip material, is shown in the drawings at **2**.

A sun gear **3** is fixed to a non-rotatable shaft **4**. Journalled on the shaft **4** is a planet carrier **5** to which is fixed a sprocket wheel **6**, also journalled on the shaft **4**. A chain **7** passes round the sprocket **6** and drives it continously about the shaft **4** in a clockwise direction, as shown by arrow A, the chain **7** itself being driven by any convenient form of drive unit (not shown). Thus the planet carrier **5** is also rotated continuously in a clockwise direction.

Rotatably carried on the planet carrier by means of a stub shaft **8** is a first planet gear **9** which meshes with the sun gear **3**. A second planet gear **10** also rotatably carried on the planet carrier **5**, by means of a stub shaft **11**, meshes with the planet gear **9**. A suction wheel **12** is eccentrically mounted on the second planet gear **10**, the suction being applied from any convenient source of suction (not shown). As the planet carrier **5** is rotated clockwise about the axis of the shaft **4** by the chain **7** the planet gears **9** and **10** are carried round the sun gear **3** and therefore rotate about their own axes in a clockwise and counter-clockwise direction respectively, as shown by arrows B and C. The suction wheel **12** will therefore be rotated eccentrically, in counter-clockwise direction, about the axis of the planet gear **10** as the latter is being carried round the shaft **4** by the planet carrier **5**. The diameters

of the sun gear **3** and the second planet gear **10** are selected to be in the ratio of 4:1.

With the arrangement so far described the point G will traverse a substantially square path, but the sides of the square will have a slight inward curvature i.e. the center of each side will be closer to the point E than in a perfect square.

If the axis of the sun gear **3** is indicated by E, the axis of the second planet gear **10** by F, and the center of the suction wheel **12** by G; and if the distances EF and FG are R and zR respectively, where z is a constant, then the position of the point G can be expressed by the following formula:

$$q=R\cos\theta+(zR)\cos(180-(n-1)\theta)$$

where y is the distance between the points E and G, θ is the angle through which the planet carrier **5** has been rotated from any given starting position, and n is the number of sides possessed by the polygonal path traversed by the point G. The quantity z is a constant (selected as below) but is different for figures having different numbers of sides. Suitable values of z are:

for $n=4$, $z=0.134$ and
for $n=3$, $z=0.293$.

In order to minimize the curvature of the sides of the substantially square path it has been found convenient to select the value of z so as to reduce to a minimum the sum of the squares of the deviations of the curved sides from a straight line.

In the drawing the path P traversed by the center of the suction wheel **12** is shown by a dotted line its four corners being shown at W, X, Y, Z, the suction wheel traversing the four sides successively as the planet carrier **5** is continuously rotated.

The web of tear strip material and the knife **1** are positioned adjacent the side WX of the substantially square path P and the mechanism above described is so arranged that as the suction wheel **12** traverses the side WX of the path P it engages the left hand end of the tear strip **2**, and as the tear strip is being progressively cut by the knife **1**, the compound movement of the suction wheel **12**, as described above, results in the tear strip being wound on to the suction wheel, until finally the whole of the cut tear strip is held by suction on the periphery of the suction wheel.

As the planet carrier **5** continues to rotate, the suction wheel **12** traverses the other three sides XY, YZ and ZW of the path P.

Adjacent the side YZ of the path P is a stationary platform **13** having a covering **14** of resilient material. A wrapper web **15** runs over the covering **14**, in the direction shown by arrow D, and passes around two pulleys **16** and **17** positioned at opposite ends (considered in the direction of movement of the web **15**) of the platform **13**.

An adhesive reservoir **18** is mounted adjacent to the pulley **16** and a wick **19** extends from the reservoir **18** to the periphery of the pulley **16** so that the latter serves to deposit a line of adhesive on the wrapper web **15** as the latter passes around the pulley **16**.

The line of adhesive is deposited in such a position on the wrapper web **15** as to be in register with the suction wheel **12** as the latter traverses the side YZ of the path P. As the suction wheel starts to move along the side YZ one end of the cut tear strip **2** is brought into contact with the line of adhesive on the wrapper web **15**. Due to the compound movement of the suction wheel **12** the tear strip **2** is unwound from the suction wheel **12**, the adhesive serving to peel the tear strip **2** off the suction wheel **12**. As the suction wheel traverses the side YZ it deviates by a small amount, as stated above, from a straight line, but the resilient covering **14** provided on the platform **13** ensures that the tear strip is at all times being pressed on to the wrapper web **15**.

When the suction wheel reaches the point Z the tear strip has been fully deposited on the wrapper web **15** and the empty suction wheel **12** is then moved along side ZW of the path P by further rotation of the planet carrier **5** so that the suction wheel **12** is again in position to pick up a further tear strip cut by the knife **1**, and transfer it to the wrapper web **15**.

It will be appreciated that suction is not applied to the suction wheel **12** throughout its movement. Suction is applied to said wheel as it traverses the sides WX and XY and is cut off as its traverses the side YZ. No application of suction is needed as the wheel **12** traverses side ZW. The application of suction to the wheel **12** requires, of course, suitable ducting (not shown) within the wheel **12**, stub shaft **11**, planet carrier **5**, and shaft **4**, and very conveniently the planet carrier **5** and shaft **4** may be formed in known manner to permit application of suction to the wheel **12** only during the appropriate portions of its motion as set out above.

What I claim as my invention and desire to secure by Letters Patent is:

1. Apparatus for applying a tear strip or the like to a wrapper web comprises a sun gear, a planet carrier, means for continuously rotating said planet carrier about the axis of said sun gear, a first planet gear rotatably mounted on said planet carrier and meshing with said sun gear, a second planet gear also rotatably mounted on said planet carrier and meshing with said first planet gear, a suction wheel mounted eccentrically on said second planet gear, so that said suction wheel is moved in a substantially rectilinear polygonal path having n sides, said suction wheel being positioned to take up a cut tear strip as said planet carrier is moving through a first arc of its circular path and to deposit said tear strip on a wrapper web as said planet carrier is moving through a second arc of its circular path, wherein the first arc of movement of said planet carrier corresponds to the suction wheel moving along one of the sides of said polygonal path and the second arc movement of the planet carrier corresponds to the suction wheel moving along a different side of said polygonal path, the ratio of the diameters of said sum gear and said second planet gear being n:1.

2. Apparatus as claimed in claim **1** including a device for cutting tear strips or the like from a web of material and a platform over which said wrapper web is guided, placed adjacent to different sides of said polygonal path.

3. Apparatus as claimed in claim **2** including means associated with said platform to apply a line of adhesive to said wrapper web, said line of adhesive being so positioned on said wrapper web that said tear strip or the like engages said adhesive as it is deposited by said suction wheel.

4. Apparatus as claimed in claim **1** in which said ratio is 4:1, whereby said suction wheel is moved in a substantially square path.

5. Apparatus as claimed in claim **4** wherein saird cutting device is positioned adjacent one side of said substantially square path and said platform is positioned adjacent the opposite side of said substantially square path.

6. Apparatus as claimed in claim **2** wherein said platform has a resilient covering on the face over which said wrapper web is guided.

7. In an apparatus for applying a tear strip or the like to a wrapper web, the improvement comprising a sun gear, a planet carrier mounted for rotation on the axis of said sun gear, means for continuously rotating said planet carrier, a first planet gear rotatably mounted on said planet carrier in meshing engagement with said sun gear, a second planet gear rotatably mounted on said planet carrier in meshing engagement with said first planet gear, and means for carrying a tear strip between first and second positions in the form of a suction wheel mounted eccentrically on said second planet gear for rotation therewith, said second planet gear being smaller in diameter

than said sun gear in a ratio of n:1, where n is three or more, so that said suction wheel traverses a substantially rectilinear polygonal path of n sides.

8. Apparatus as claimed in claim 7 including a device for cutting tear strips or the like from a web of material and a platform over which said wrapper web is guided, placed adjacent to different sides of said polygonal path.

9. Apparatus as claimed in claim 8 including means associated with said platform to apply a line of adhesive to said wrapper web, said line of adhesive being so positioned on said wrapper web that said tear strip or the like engages said adhesive as it is deposited by said suction wheel.

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